PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements relating to Mechanical Seals for Rotating Shafts

We, FLEXIBOX LIMITED, a British Company, of Nash Road, Trafford Park, Manchester 17, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THIS INVENTION RELATES to mechanical seals for rotating shafts and is particularly concerned with such seals operating under conditions where it is desirable to have a stand-by seal unit available which can be brought into service if the main seal unit becomes damaged.

Tandem arrangements of mechanical seal units are known but the stand-by unit usually has its sealing faces rubbing together when on the stand-by duty.

The object of the present invention is to provide an improved tandem mechanical seal system in which the faces of the stand-by unit are not rubbing together when such unit is on stand-by duty.

The invention consists in a mechanical seal for a rotating shaft comprising a main seal unit and a stand-by seal unit which is brought into service if the main seal unit becomes damaged, in which the stand-by unit has a stationary seal ring which is normally held out of engagement with its co-operating rotary seal ring by spring pressure and is moved into engagement with the rotary seal ring by hydraulic pressure.

The invention further comprises a mechanical seal for a rotating shaft in which when the main seal unit fails, leakage liquid from such unit is utilised to bring the stand-by seal unit into operation.

The invention further comprises a mechanical seal as aforesaid in which liquid escaping through the main seal unit passes to a vessel in which the liquid level builds up until it causes a switch to close a circuit and operate a solenoid valve which allows pumped liquid to pass into a space behind a piston to move the latter and bring the stationary seal ring of the stand-by unit into engagement with its associated rotary seal ring and make a fluid tight joint therewith.

The invention further comprises a mechanical seal as aforesaid in which the piston is of annular form and compresses a series of springs annularly disposed in a member which operates the stationary seal ring to bring it into engagement with the rotary seal ring of the stand-by seal unit.

The invention further comprises a mechanical seal as aforesaid in which means are provided for locking the piston in a position to hold the stand-by seal unit in its service position.

The accompanying explanatory drawing shows complete operative and stand-by seal system in accordance with the present invention.

The normally operative or main seal comprises a stationary seal ring *a* and a rotary seal ring *b* which is pinned to the member *c* which rotates with the shaft *d* of a pump unit. The stand-by seal comprises a stationary seal ring *e* which when the stand-by seal is in action bears against a rotary seal ring *f* which revolves with the aforesaid member c secured to the pump shaft *d*.

The normally operative seal cooling circulation from the pump discharge is by way of the pipe *g*, the branch *h* with the flow controller *i* thereon, the space *j* around the seal members a and *b*, and *a* circulation outlet branch at *k* leading to the pump suction. The space *m* is on the pump suction side.

If there is a failure at the main operative

[*Price* 4*s*. 6*d*.]

Price 25p

Price 25p

seal *a*, *b*, liquid will flow through such seal to the space *n* around the stand-by seal *e*, *f* and from there via the connection *o* to the tank *p*. This will cause a switch at *p'* to pass current to a solenoid operated valve *q* which will allow liquid to flow to the space *r* behind the piston *s* which will then through the the springs *t* cause the member *u* to press the seal ring *e* into engagement with the ring *f* so that the stand-by seal will become fully operative. If desired a number of pistons arranged in an annulus may be substituted for the single piston *s* to compress the springs *t*. If such seal has to be operative over a prolonged period, the connection to the solenoid valve *q* can be put out of action, and the by-pass valve *q'* opened. The stand-by seal will then remain operative indefinitely. When pressure is removed from behind the piston *s*, the latter will be returned to its out-of-service position by the spring *v*.

The pipe *w* is a vent pipe which can be controlled by an automatic or air operated air valve *x*.

If the stand-by seal is to be more or less permanently in use at any time, the sleeve nut *y* can be screwed home to press the piston *s* firmly against the spring *t* and so put the seal ring *e* into engagement with the seal ring *f*.

The pipe *z* serves to provide a stand-by seal circulation around the stand-by seal to the tank *p*. There is a non-return valve 10 on the delivery from the tank *p*.

If desired the pressure on the piston *s* can be obtained from an electrically driven auxiliary pump whose motor is switched into service by means of the increases of liquid level in the tank *p*.

In another form, the invention is also applicable to the sealing of the stern tube gland of a ship or submarine where the actuating pressure to bring into operation the stand-by seal is the same as the pressure being sealed the mode of actuation being as previously described. On such a duty, the circulation of liquid to cool the seal may not be necessary normally, but where such cooling is required, it is effected by a separate system incorporating electrically operated isolating valves and a pump and cooler with the stand-by seal cooling system brought into operation by the level actuation switch previously described.

The seal rings may be of one piece construction or split into two or more pieces.

WHAT WE CLAIM IS:—

1. A mechanical seal for a rotating shaft comprising a main seal unit and a stand-by seal unit which is brought into service if the main seal unit becomes damaged, in which the stand-by unit has a stationary seal ring which is normally held out of engagement with its co-operating rotary seal ring by spring pressure and is moved into engagement within the rotary seal ring by hydraulic pressure.

2. A mechanical seal for a rotating shaft as claimed in claim 1, in which when the main seal unit fails, leakage liquid from such unit is utilised to bring the stand-by seal unit into operation.

3. A mechanical seal as claimed in claim 2, in which liquid escaping through the main seal unit passes to a vessel in which the liquid level builds up until it causes a switch to close a circuit and operate a solenoid valve which allows pumped liquid to pass into a space behind a piston to move the latter and bring the stationary seal ring of the stand-by unit into engagement with its associated rotary seal ring and make the fluid tight joint therewith.

4. A mechanical seal as claimed in claim 3, in which the piston is of annular form and compresses a series of springs annularly disposed in a member which operates the stationary seal ring to bring it into engagement with the rotary seal ring of the stand-by seal unit.

5. A mechanical seal as claimed in claim 4 in which means are provided for locking the piston in a position to hold the stand-by seal unit in its service position.

6. The improved mechanical seal comprising a main seal unit and a stand-by seal unit, substantially as described and as illustrated in the accompany drawing.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*